OTHER DOCUMENTS

Performance Report

October 2013-April 2015

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Project Description

The longstanding Interagency Acquisition Agreement (BOR: R11PG20295 / USFS:11-IA-11051400-042) between the United States Forest Service, Shasta-Trinity National Forest (USFS) and the US Bureau of Reclamation (BOR) was modified for the 4th time on September 5, 2013 and awarded the USFS $165,591 to complete road storm-proofing work on 30.6 miles of 129 miles (as stated in the proposal that was modified to match the funding available submitted by the USFS to Trinity River Restoration Program in a proposal on February 5, 2013). The original proposal was to improve 140 miles of roads; however funding was not available to complete these critical objectives over such a large area, so the decision was made to tackle the road work in phases over time with an estimate of 5 years needed to address identified road issues (roughly 28 miles per year). Modification #4 however mentions in Task 3.1 that erosion and sedimentation will be controlled from 140 miles in the priority watershed areas (watersheds that drain Trinity River main stem below Lewiston Dam to North Fork Trinity River).

The 17 miles of road work proposed under this first phase of this project was all within the Grass Valley-Weaver Watershed. It was a portion of the roads identified as needing maintenance and upgrades from the recent Sediment Source Inventory[1] (SSI). The 140 miles identified in the Agreement modification includes all roads within the priority work area even those that fall outside of the contracted SSI area.

A second part of the work to be performed under modification #4 included efforts to further develop a native seed and seedling nursery that would be utilized in this project, as well as other future restoration projects. A separate proposal was developed by the Trinity County Resource Conservation District (TCRCD) for $15,000. It was agreed that the USFS would develop another sub-agreement with the TCRCD to complete this work with the $165,591 that was awarded to the USFS.

Project Objectives

The primary objective for this project was to reduce road-related erosion and sedimentation originating from National Forest System (NFS) roads by maintaining and improving road drainage within Trinity River watersheds that currently contribute controllable sediment to the Trinity River. This work would help to prevent catastrophic landslides, earthflows, or large gullies that can result from poorly maintained roads in steep forested watersheds. These episodic events have the potential to damage or destroy Trinity River main-stem Restoration Program investments already - or yet to be- completed.

The storm-proofing work is designed to improve accessibility and navigability of roads by assuring that public roads are designed to largely self-maintain. The storm-proofing work creates self-maintaining roads by 1) 'rolling the grade' to have greater road lengths out-sloped to the extent feasible; 2) increasing the frequency of rolling dips; 3) installing cross drains where inside ditches are needed; 5) ensuring that crossings properly function and adequately pass stream flows, bed load, fish and other aquatic biota and 6) providing a designed

[1] *North State Resources, Final Sediment Source Inventory Report, December 2012.*

failure point so when the pipe fails it minimizes loss of road fill. Following treatment, all treated roads meet varying levels of the storm-proofing continuum provided in Attachment A.

A secondary objective of this project included establishing a repository of native plant materials for future restoration areas. The TCRCD had a small nursery that needed further development of a local native plant propagation program promoting greater revegetation success.

Why the Work Is Needed

The Trinity River is a sediment impaired sub-basin with a TMDL stipulation (EPA 2001). Attaining the sediment reduction goals of the TMDL and the Trinity River Restoration Program can best be achieved by improving road stability and reducing chronic sedimentation through road drainage improvements. The Shasta Trinity National Forest (STNF) manages approximately 70% of the Trinity River watershed and has several thousand road miles to maintain. Yet the Forest's road maintenance budget is insufficient to address all routine road maintenance needs over the 2.1 million acres of National Forest System (NFS) lands which it administers.

Figure 1. Inadequate road drainage & rill erosion

Figure 2. Improved road drainage and grading

Prioritization of work

Aquatic Transportation Analysis Program (TAP) ratings indicating a high or moderate risk to aquatic resources, as well as the North State Resources risk analysis from the SSI as well as the number of issues identified on each road were utilized to prioritize treatments by road within each of the priority areas. Priorities were used only as a guide and were adjusted while moving through a priority area other lower priority routes in the vicinity were also addressed, to provide a more efficient means of implementing treatments, completing them as they moved from one cluster of priority roads to the next priority cluster of roads.

Accomplishments

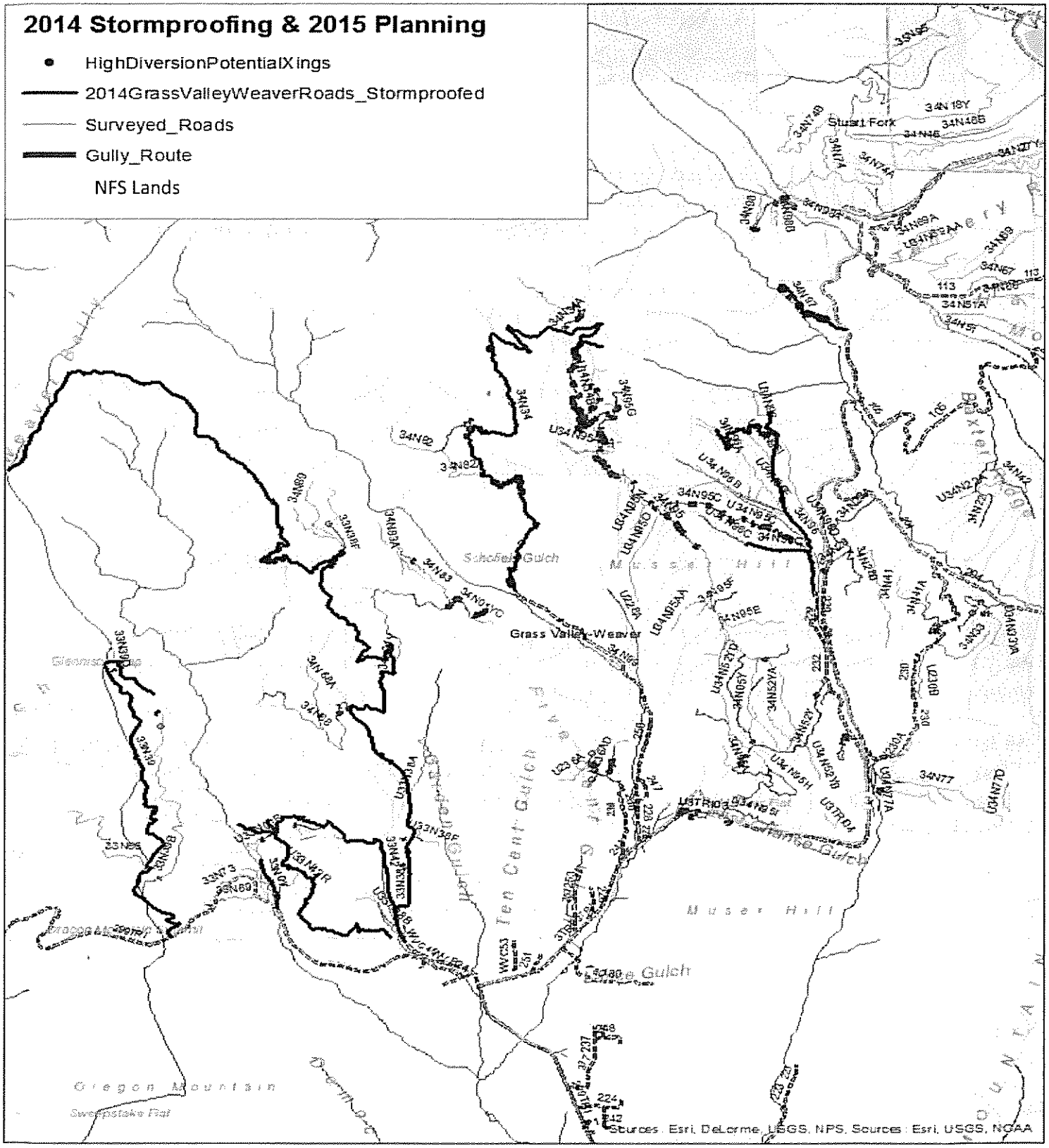

Figure 1. 2014 Stormproofing

Table 1. Summary of Accomplishments

Performance Period Dates	Summary of Action Taken by Performance Period
September 5, 2013	*Agreement modification signed*
September 2013 – December 2013	*Work Orders developed for Botanical & Archeological Surveys* *Developed Agreement for Native Nursery with TC RCD* *Planning / Staffing* *Government Furlough & Funding shut down (October 1-16, 2013)*
January 2014 – April 2014	*Ground Reconnaissance* *Began Botanical & Archeological Surveys* *Storm-proofed 2.0 miles*
May 2014 – August 2014	*Finished Botanical & Archeological Surveys* *Storm-proofed 28.6 miles*
September 2014 – December 2014	*Inspected Native Nursery Progress* *Repaired roads damaged from Oregon Fire*
January 2015 – April 2015	*Closed Native Nursery Agreement* *Planning for FY15 field season (17 miles proposed RX in Browns)*

In 2013, the STNF received $165,591 from the Bureau of Reclamation to complete road storm-proofing within the Trinity River Restoration Program "priority areas[2]" and to establish a native nursery for use in future restoration projects with the coordination of the Trinity County RCD (TCRCD).

An agreement was established with TCRCD in 2013 for the nursery. They collected seeds from locations which all have future restoration efforts and began propagating many of the seedlings. The stock at the nursery increased significantly with vegetation types that are suited for the areas in which they would be re-established. It was a great success.

[2] *Priority areas include the Trinity River and tributaries below Lewiston Dam and upstream from the confluence of the North Fork Trinity River at Helena, CA.*

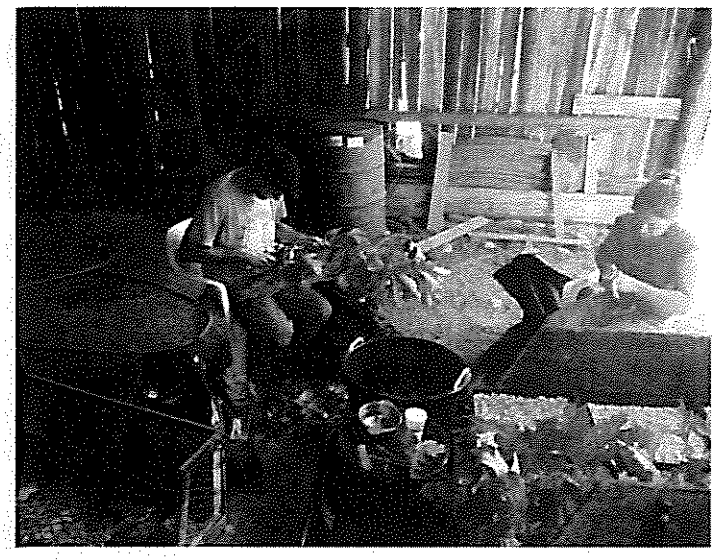

Figure 3. Preparing native plants for propagation

Figure 4. Native seeds collected & sorted for use in future restoration

Figure 5. Native nursery stock ready for planting.

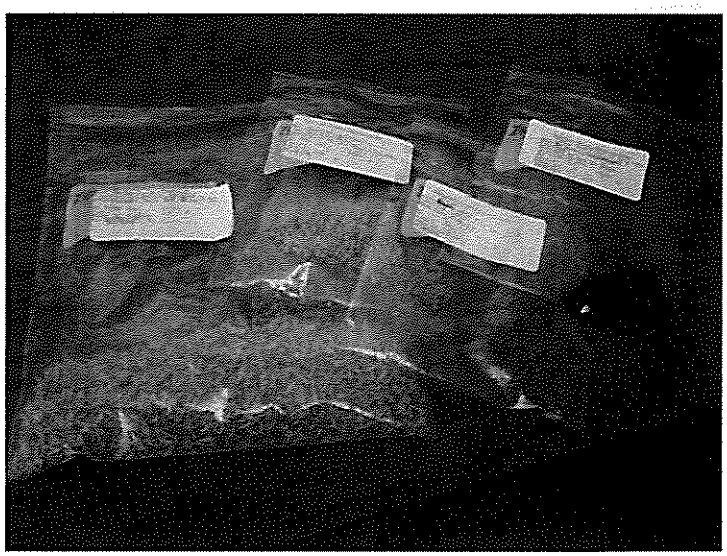

Figure 6. Native seeds collected from future restoation sites

Due to staffing issues and government furlough, the road work did not begin until the 2014 field season. In 2014, the Forest completed 30.6 miles of storm-proofing work on 20 different road segments all located in the Grass Valley Weaver Watershed (this is a 5th field watershed which includes East and West Weaver Creeks, as well as Grass Valley Creek sub-watersheds).

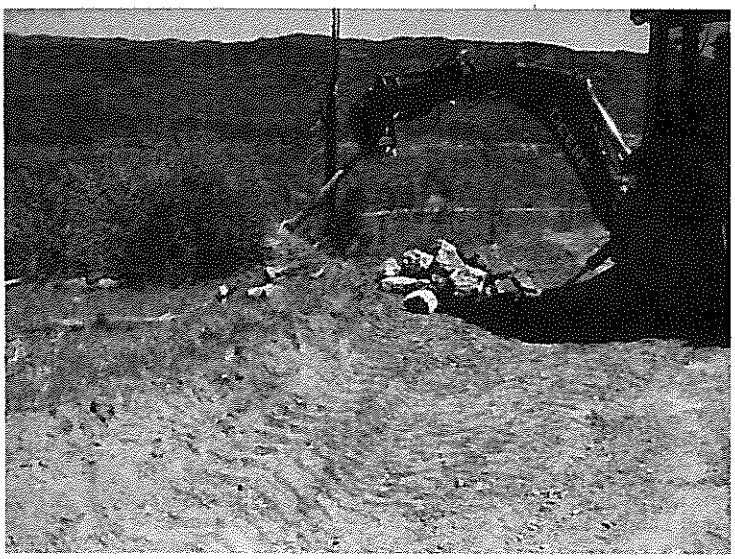

Figure 7. Constructing an armored rolling dip outlet

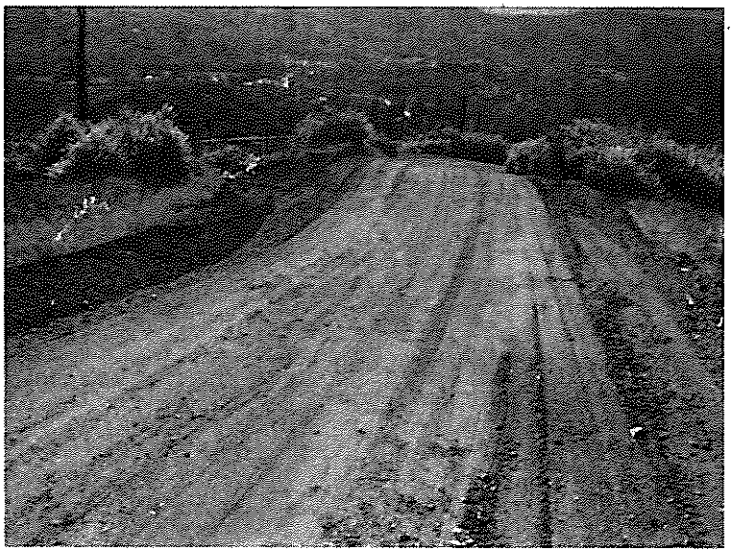

Figure 8. Newly constructed rocked rolling dip

Figure 9 & Figure 10. Disconnecting flow to stream with energy dissipation and flow dispersal

Road storm-proofing work is basically complete on 20 different system roads segments on 30.6 miles in the Grass-Valley Weaver Watershed depicted on Figure 1 above. Two of the roads treated (33N39 & 34N34) were completely brushed in on the ends and are considered to be stabilized / storm-proofed; so actual road treatments occurred on 26 miles (See Table 2). Road logs of work completed in 2014 are contained in Individual Quarterly Performance Reports #2 and #3. The road logs are only available for one unclassified road that needed more work than the others; however measures were taken to insure that all non-system roads were stable and inaccessible to traffic. The roads that were treated are the following:

Table 2. Roads Treated in 2014

#	Road ID	Treated miles	Additional miles
1	33N01	0.6	
2	33N38	9.5	
3	33N39	2.2	1
4	33N42	2.0	
5	34N24_1	3.4	
6	34N34	1.6	3.6
7	34N96	1.8	
8	34N96A	1.1	
9	34N96B	0.2	
10	34N96C	0.4	
11	34N97	0.3	
12	34N97A	0.3	
13	U230A	0.3	
14	U33N01B	0.2	
15	U33N42R_3	0.5	
16	U34N52YD	0.9	
17	U34N77A	0.4	
18	U34N96BF	0.2	
19	U3TRI01A	0.1	
20	U3TRI03F	0.1	
Totals	30.6	26.0	4.6

The original proposal estimated how many miles would be completed based on roads treatments from highest to lowest priority which generally are the most expensive to treat since they have the most problems. In reality road in the vicinity were treated at the same time that had fewer issues and lower costs; as a result the funding was actually sufficient to complete an additional 11 miles f or a total of 30.6 miles with roughly $22,000 remaining. We were unable to continue doing additional storm-proofing work because we had treated all of the areas for which we had archeological and botanical clearance; additional surveys were necessary to complete more work.

The accomplishments included considerably more out sloping and berm removal that originally anticipated; this is a significant achievement toward attaining self-maintaining roads by dispersing runoff and significantly reducing erosion potential. Our treatments resulted in changing roughly 5 miles from in sloped roads to out sloped roads.

Erosion Reduction

The modelled erosion rates[3] for the roads in poor condition were 104 tons per mile per year for out sloped roads and 90 tons per mile per year for in sloped roads in poor condition. Once the roads are storm-proofed this is reduced to 48 tons per mile for out sloped roads and 43 tons per mile for in sloped roads.

The amount of the erosion that is expected to be transported from the road prism is another output from the WEPP model The values depicted for sediment transport rates in Table 3 below show that an in sloped road in poor condition erodes 90 tons per mile but actually generates additional erosion beyond the modelled road prism due to the concentrated flows associated with roadside ditches; resulting in 95 tons per mile that are transported due to the condition and orientation of an in sloped road prism. An in sloped road in good condition is expected to transport materials that are eroded, which means that the inside ditch will continue to function and not fill or further erode once a road is storm-proofed. The transport rates for out sloped roads always have a decrease from erosion rates to transport rates because the flows are dispersed over the hillslope below and the energy is dissipated reducing further erosion and reducing the sediment transported from the road prism.

Table 3. 2015 WEPP Erosion Rates by Road Type & Condition

Road type[4]	Tons Eroded/ mi/yr	Percent Reduction/ yr	Tons xported/mi/yr
OS poor condition	104		86
OS improved	48	47%	31
IS poor condition	90		95
IS improved	43	48%	43
IS poor -->OS good	48	54%	31

Table 4. Erosion Reduction from 2014 Road Work

Road Condition:			Poor Condition		Good Condition			
Road orientation[5]	Road miles	Treatment miles	Eroded tons/mi/yr	Original Erosion Rate tons/yr	Eroded tons/mi/yr	Improved Erosion Rate (tons/yr)	Reduction (tons/yr)	% Reduction
IS	15.3	15.3	90	1370	43	657	713	48%
IS--> OS		4.8	90	430	48	232	198	54%
OS	15.3	10.7	104	1090	48	508	582	47%
Totals:		30.6		2890		1397	1493	48%

[3] *Erosion rates are based on WEPP 2015. See model runs & variables used in Attachment D*

[4] *OS = Out sloped, IS=In sloped*

Figure 11. Road thru-cut rocking

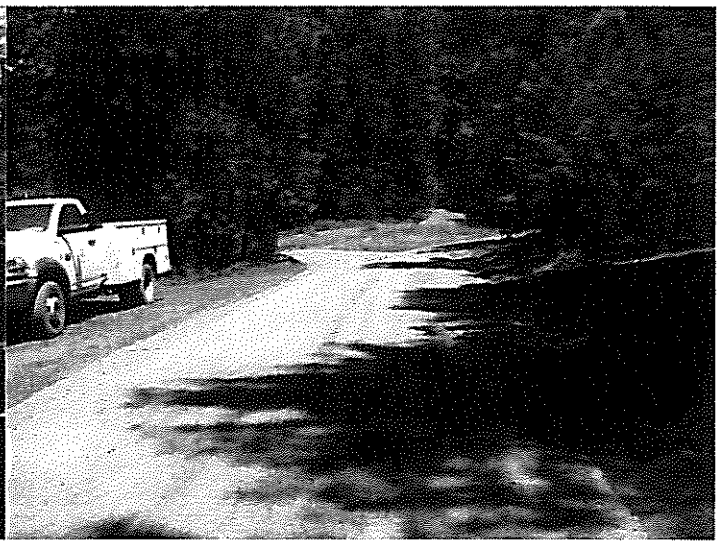

Figure 12. Finished product stabilized road bed

Table 5. 2015 WEPP Erosion Rates by Road Type & Condition

Road orientation[6]	% Sedimentation Reduction[7]
os_p-->os_g	64%
is_p-->is_g	20%
is_p-->os_g	84%
Ave	56%[8]

The 30.6 miles of road storm-proofing work completed in 2014 resulted in a reduction of 1493 tons per year in the Grass Valley-Weaver Watershed. That is a 48% average reduction over the erosion rates present on these same roads before treatments (Table 4). Table 5 takes this one step further and looks at the amount of sediment likely to enter a stream. The average sediment reduction rate is 56% over all road types, with as great as an 84% reduction when converting from in sloped roads in poor condition to out sloped roads in good condition. Even though the sediment reduction rates of 56% from these treated roads exceeds the TMDL (2001 EPA) sedimentation reduction rate of 41% required within this area, work needs to continue until all roads are improved and are more resilient to impacts.

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[5] *Road orientation was assumed to be half in sloped and out sloped prior to work.*

[6] *(OS=out slope, IS=in slope, p=poor condition, g=good condition)*

[7] *Based on WEPP sediment leaving profile. Assumed 10% of sediment leaving in sloped roads, and 5% leaving out sloped roads goes to streams)*

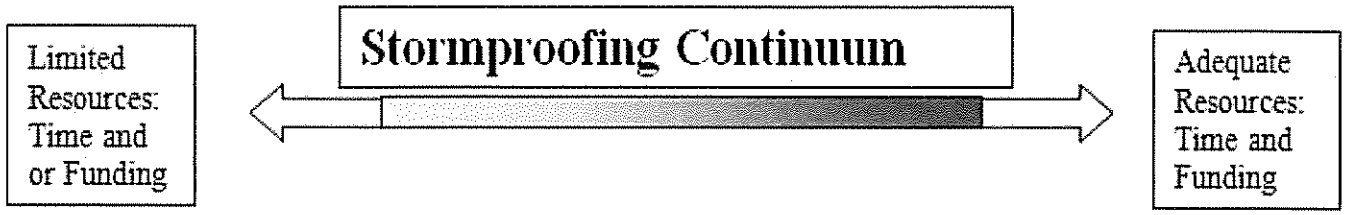
[8] *EPA 2001 TMDL calls for a 41% reduction in sedimentation from all sources within these treatment areas in the Grass Valley Weaver Watershed.*

Future Work

There are 93 miles of storm-proofing road work needed based on the SSI (North State Resources 2012) as depicted in Table 6. The remaining $22k from Modification #4 is proposed to use on some additional finishing work to the Rush Cr Campground road (34N97), begin treating on Musser Hill Road spurs (off of 34N95) and closing additional unauthorized routes in the Grass Valley-Weaver Watershed. It is planned to complete 7-10 miles of roads in 2015 and to increase our capacity with additional staffing and equipment to treat roughly 40 miles per year in 2016 and 2017.

Table 6. 2015-2017 Proposed Road Stormproofing

Remaining Stormproofing Work by Watershed	miles
Grass Valley-Weaver	24
Canyon Creek	15
Browns (17 miles planned 2015)	54



Treatment	Minimum	Median	Maximum
Pipe Replacement	Failed or failing pipes only	High risk pipes replaced or retrofitted to improve function and reduce erosion.[1]	All or most undersized pipes replaced
Pipe Maintenance	All pipes are cleared and free flowing	All pipes are cleared and free flowing	All pipes are cleared and free flowing
Ditches	All ditches are cleared and free to carry flow	Ditches in poor condition have improvements made to reduce flow or stabilize banks and where feasible are eliminated.	Roads are out sloped to the extent feasible to eliminate the need for a ditch system.
Berms	Berms that are concentrating flows are breached intermittently. (A hole is punched through).	Berms are breached intermittently and some redesign of road grade and drainage patterns to eliminate berms.	Berms are eliminated on 80% of road system except where needed to protect sensitive soils on steep slopes or unstable features.
Critical Dips	Critical dips are constructed at all perennial and intermittent crossings. Critical dips with signs of erosion are armored.	Critical dips are enhanced and armored at all perennial crossings.	Critical dips are in place and well armored at all crossings.
Rolling Dips	Reconstruct any failing rolling dips and install those needed to prevent damage to the road system.	Reconstruct rolling dips to improve long term sustainability. The more subtle, longer, gradual dips tend to hold up best. Insure outlets have adequate energy dissipation.	Increase frequency of rolling dips to better mimic natural drainage pattern that would exist without the road.

[1] Retrofitting could include mitering pipe ends, armoring or reinforcing headwalls or outlets for energy dissipation, trash racks or snorkel structures, pipe extensions, over-side drain armoring or extensions, etc.

Attachment B

Table B.1 Comparison of Work Proposed and Work Completed

	New pipe	Culverts cleaned	Critical Dips	Rolling dips	Disconnect Road from streams	Berm close/ water bar	Ditch work (mi)	Spot rock (mi)	Gully repair
Proposed	0	53	17	132		0	0	2.5	0
Complete	2	67	94		68	28	3.7	2.5	2

Attachment C

Table C.1 Synopsis of Unsolicited Contributions from the USFS on this Project to Date
(In addition to BOR funds)

USFS funds	USFS Unsolicited Contributions
$ 24,192 $ 16,580 $ 37,296 **$ 77,868**	Sediment Source Inventories (SSI) • Grass Valley - Weaver SSI (GV-WV) • Browns SSI • Clear Cr SSI
$ 35,450	Work Orders developed for Botanical Surveys GV-WV
$ 30,000	Work Orders developed for Archeological Surveys
$ 7,500	Work Orders developed for Archeological Surveys for 2015
$150,818	Total USFS Investment (staff time not included)

Attachment D

Table D.1: WEPP 2015 - Modelling Parameters and Results

WEPP:Road log

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Yrs	Climate	Soil	Rock	Surface, traffic	Design	Road grad	Road len	Road width	Fill grad	Fill len	Buff grad	Buff len	Precip	Rain runoff	Snow runoff	Sed road	Sed profile	Comment
30	Trinity_Blw_Lewiston_+	sandy loam	25 %	native high	outsloped rutted	5 %	500 ft	14 ft	50 %	30 ft	25 %	130 ft	61.19 in	10.81 in	1.77 in	20759.14 lb	17202.81 lb	WeppRoad_BlwLewiston_outsloped_rutted
30	Trinity_Blw_Lewiston_+	sandy loam	25 %	native high	insloped bare	5 %	500 ft	14 ft	50 %	30 ft	25 %	130 ft	61.19 in	10.81 in	1.77 in	17912.90 lb	18945.30 lb	TrinityRBlwLewiston_Insloped_Bare_highdisturb
30	Trinity_Blw_Lewiston_+	sandy loam	20 %	graveled low	insloped vegetated	4 %	200 ft	13 ft	50 %	15 ft	25 %	130 ft	61.19 in	6.53 in	0.50 in	1786.25 lb	1689.88 lb	TrinityRBlwLewiston_insloped_VegDitch_rocked_lowtraffic
30	Trinity_Blw_Lewiston_+	sandy loam	25 %	graveled low	insloped vegetated	5 %	500 ft	14 ft	50 %	30 ft	25 %	130 ft	61.19 in	9.90 in	1.00 in	8590.58 lb	8509.26 lb	
30	Trinity_Blw_Lewiston_+	sandy loam	25 %	graveled high	insloped bare	5 %	500 ft	14 ft	50 %	30 ft	25 %	130 ft	61.19 in	9.90 in	1.00 in	17701.86 lb	15133.44 lb	TrinityRBlwLewiston_Insloped_maintained
30	Trinity_Blw_Lewiston_+	sandy loam	25 %	graveled low	outsloped unrutted	5 %	500 ft	14 ft	50 %	30 ft	25 %	130 ft	61.19 in	2.39 in	0.19 in	9667.31 lb	6160.98 lb	TrinityR_BlwLewiston_maintained_gravel_lowtraffic_unrutted

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WEPP Roads modelling used a climate adjusted from Shasta Dam precipitation adjusted by latitude, longitude and elevation of Lewiston dam